Dominion Nuclear Connecticut, Inc.
Millstone Power Station
Rope Ferry Road
Waterford, CT 06385

Dominion

January 23, 2004

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Serial No.: 04-044
NL&OS/PLW: Rev 0
Docket No.: 50-336
License No.: DPR-65

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION, UNIT 2
SIXTY-DAY REPORT, NRC ORDER EA-03-009

On February 11, 2003, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-03-009 establishing interim inspection requirements for reactor pressure vessel (RPV) heads at pressurized water reactor facilities. During the most recent refueling outage (2R15) at Millstone Unit 2, Dominion Nuclear Connecticut, Inc. (DNC) completed the required inspections and returned the plant to operation on November 26, 2003. As required by Section IV.E of the Order, DNC is providing the results of its inspections as Attachment 1 to this letter.

If you should have any questions regarding this submittal, please contact Mr. David W. Dodson at (860) 447-1791, extension 2346.

Very truly yours,

Leslie N. Hartz
Vice President – Nuclear Engineering

Attachments: (1)

Commitments made in this letter: None.

cc: See next page

A101

cc: U. S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

R. M. Pulsifer
Project Manager, Millstone Unit No. 2
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Mail Stop 8B1
Rockville, MD 20852-2738

Mr. S. M. Schneider
NRC Senior Resident Inspector
Millstone Power Station

The Director, Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

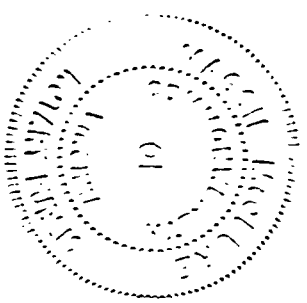
The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Leslie N. Hartz who is Vice President – Nuclear Engineering of Dominion Nuclear Connecticut, Inc. She has affirmed before me that she is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of her knowledge and belief.

Acknowledged before me this 23rd day of January, 2004.

My Commission Expires: 3/31/04.

Maggie McClure

Notary Public



Attachment 1

Sixty-Day Report
NRC Order EA-03-009

Sixty-Day Report
NRC Order EA-03-009

During the most recent Millstone Unit 2 refueling outage (2R15), Dominion Nuclear Connecticut, Inc. (DNC) completed the inspection of the Reactor Pressure Vessel (RPV) head required by the U.S. Nuclear Regulatory Commission (NRC) Order EA-03-009. DNC returned the plant to operation on November 26, 2003. Section IV.E of the Order requires licensees to submit reports detailing the inspection results within sixty days after returning plants to operation. The balance of this attachment summarizes the results of the required inspections.

INSPECTION OVERVIEW:

Millstone Unit 2 is in the highest susceptibility category as a result of having accumulated greater than 12 Effective Degradation Years, which was calculated in accordance with the methodology provided in the Order. For those plants in the high category, reactor pressure vessel (RPV) head and penetration nozzle inspections must be performed using the following techniques every refueling outage;

(a) Bare metal visual (BMV) examination of 100 percent of the RPV head surface (including 360 degrees around each RPV head penetration nozzle), AND

(b) Either;

(i) Ultrasonic testing of each RPV head penetration nozzle (i.e., nozzle base material) from two inches above the J-groove weld to the bottom of the nozzle and an assessment to determine if leakage has occurred into the interference fit zone, OR

(ii) Eddy current testing or dye penetrant testing of the wetted surface of each J-groove weld and the RPV head penetration nozzle base material to at least two inches above the J-groove weld.

DNC performed a bare metal visual (BMV) examination of the exterior surface of the reactor head to comply with the requirements of the Order. Insulation on top of the RPV closure head was not designed for its removal or to permit access for a BMV examination. The Control Element Drive Mechanism (CEDM) shroud was also not removed for this inspection. A combination of direct visual and remote visual techniques was used to obtain the necessary coverage. The insulation package is a mirror insulation design, and contoured to the vessel head. During the refueling outage the insulation package was extensively worked in an effort to facilitate a direct visual examination. However, some sections of the insulation package could not be removed. In these instances access for the BMV examination was achieved by placing wedges beneath the insulation to allow a remote visual examination of the bare metal. All of the inspectors that performed the evaluation or interpretation of the BMV examination results were certified to a minimum of a VT-2 Level II.

For the inspection of penetration nozzles, DNC requested and was granted relaxation from the requirements in the Order to support the ultrasonic examination (UT) of CEDM nozzles to the extent practical below the J-groove weld while using supplemental dye penetrant testing (PT) of nozzles for selected CEDMs,[1] and the use a combination of UT and PT on the vent line nozzle.[2] The supplemental PT was done on six CEDM nozzles to obtain adequate inspection coverage below the J-groove weld. The completed inspection performed a UT of all 78 penetrations nozzles of the RPV head. The nozzles included the single vent line, sixty-nine CEDMs, and eight incore instrumentation (ICI) nozzles.

BARE METAL VISUAL EXAMINATION RESULTS:

No degradation from corrosion or gross wastage was observed, and no evidence of leakage in penetrations was found. No evidence of the characteristic tenacious "popcorn" type deposit was detected by the examination around any penetration to nozzle interface.

A large percentage of the RPV head surface area did show evidence of a boric acid residue as a light, transparent film. Evidence existed that there had been boric acid leakage from above. The evidence of boric acid was heavy enough to obtain samples for chemical analysis on the surface area on the downhill side of CEDM 44, 57, and 60. There were no encrusted deposits present on the surface of the closure head so samples were obtained by a HP-type swipe. Analysis of these samples confirmed the presence of boron and lithium indicating that the material was from reactor coolant leakage. Isotopic analysis of these samples was performed to assist in age determination. The ratio of Cs-134 to Cs-137 in the swipes was used to determine the age of the residue. Analysis indicated that the leakage occurred in the 1988 time frame, which is consistent with documented leakage from the reactor vessel flange. The thin-film nature of the residue sampled (versus encrusted deposit), further supports the conclusion the residue is the result of leakage from the vessel flange that migrated through the head insulation, and not from flaws in nozzles 44, 57 or 60.

PENETRATION NOZZLE EXAMINATION RESULTS:

The completed inspection included a UT of all 78 nozzles of the RPV head. These nozzles included the single vent line, sixty-nine CEDMs, and eight incore instrumentation (ICI) nozzles. Cracking was identified in eleven CEDM nozzles. All indications of cracking were axially oriented along the outside diameter of the nozzle at the toe of the weld, or below the toe of the weld. No indication was observed to be extended through the elevations needed to breach the pressure boundary J-groove

---

(1) NRC letter, "Relaxation of the Requirements of Order EA-03-009 Regarding Reactor Pressure Vessel Head Inspections, Relaxation Request No. RR-89-48, Millstone Power Station, Unit No. 2, (TAC No. MC0942)," November 21, 2003, (Accession ML033220099).

(2) NRC letter, "Relaxation of the Requirements of Order EA-03-009 Regarding Reactor Pressure Vessel Head Inspections, Millstone Power Station, Unit No. 2 (TAC No. MC0619)," October 14, 2003, (Accession ML032690641).

weld. No indications had propagated through the wall of the nozzle base material. Table 1 summarizes the indications on the eleven nozzles. Although an axial indication in nozzle 46 was observed, the indication was not listed in Table 1 because it was not surface connected or in contact with the wetted surface, and was not characterized as cracking or requiring repair. Confirmatory PT examinations were performed on the J-groove welds of nozzles that exhibited UT indications. The PT examinations detected no additional indications.

The indications on CEDM nozzles 13, 31 and 47 were repaired with grinding. The other eight CEDM nozzles with indications requiring weld repairs were nozzles 17, 22, 26, 37, 42, 57, 60 and 68. Weld repairs on these eight penetrations were performed to remove the indications.

Although evidence of cracking was observed from UT data, no evidence of a leak path signature above the J-groove welds and into the interference fit was noted on any of the ICI or CEDM penetrations examined. Leakage assessment of the vent line was done with a dye penetrant (PT) examination of the J-groove weld, which found no indication of cracking.

Each penetration was scanned to the maximum extent possible below the weld to at least two inches above the uphill side of the weld. The lower end of each CEDM penetration is threaded on the Inside Diameter (ID) to permit attachment of the permanently installed guide funnel. The guide funnel precludes an effective UT examination in the threaded region, which reduces UT examination coverage below the weld to the end of the nozzle. The amount of UT examination coverage obtained during the refueling outage for CEDM nozzles is shown in Table 2. A PT was performed to supplement UT examination coverage below the weld on six nozzles with the most limited UT coverage that did not require a repair. There were no indications found using this supplemental PT.

TABLE 1:
REFUELING OUTAGE 2R15 ULTRASONIC EXAMINATION SUMMARY

Pen. No. [4]	Pen. Angle	Indication Length, inches	Indication Depth, inches [5]	Surface (ID/OD)	Indication Location [1] [2]	Flaw Removal by Grinding [3]
13	22.4°	0.61	0.15	OD	Below weld to toe of weld, 29°	yes
		0.75	0.06	OD	Below weld to toe of weld, 270.9°	yes
17	23.9°	1.25	0.30	OD	Below weld into toe of weld, 289.9° - 298.8°	no
22	25.3°	0.73	0.16	OD	Below weld into toe of weld, 52.2°	no
		0.36	0.11	OD	Below weld into toe of weld, 82.2°	no
26	29.1°	0.55	0.39	OD	Below weld into toe of weld, 11.4°	no
		0.69	0.17	OD	Below weld into toe of weld, 50.6°	no
31	29.1°	0.94	0.11	OD	Below weld into toe of weld, 55.5°	yes
37	35.6°	0.79	0.35	OD	Below weld into toe of weld, 319.9°	no
42	38.5°	0.75	0.35	OD	Below weld into toe of weld, 306.4°	no
47	38.5°	1.01	0.15	OD	Below weld into toe of weld, 26.4° - 32.9°	yes
57	37.1°	0.59	0.19	OD	Below weld into toe of weld, 16.4°	no
		0.43	0.36	OD	Below weld into toe of weld, 352.5°	no
60	42.5°	0.76	0.18	OD	Below weld to toe of weld, 24° - 32°	no
68	42.5°	0.77	0.29	OD	Below weld into toe of weld, 325.8°	no

Notes:
(1) Downhill side of nozzle is designated at 0 degrees. Leak path check using UT found no evidence of leakage for any penetration nozzle.
(2) Bare metal visual (BMV) examination found no evidence of leakage in penetration nozzles.
(3) Nozzles were repaired where grinding did not remove a flaw.
(4) Huntington Alloys is nozzle material manufacturer. Nozzle 47 is heat NX1314 with a yield stress of 60 ksi. The heat of other listed nozzles is NX1405 with a yield stress of 54 ksi.
(5) CEDM nozzle thickness is equal to 0.566 inches, with outside diameter of 3.85 inches.

TABLE 2
EXTENT OF ULTRASONIC TEST (UT) EXAMINATION COVERAGE IN CEDM NOZZLES IN (2R15)
- List Sorted by Downhill Side Coverage -

Angle	Penet. No.	Minimum Distance Below the Weld Toe (Inches)			Penet. No.	Minimum Distance Below the Weld Toe (Inches)		
		On the Downhill Side	90° From Downhill	270° From Downhill		On the Downhill Side	90° From Downhill	270° From Downhill
	55 (1)	0.23	2.32	2.30	58	0.55	2.99	2.76
	59 (1)	0.25	3.10	2.67	69	0.55	3.00	2.70
	42 (2)	0.31	2.28	2.31	31	0.56	1.93	2.12
	27 (1)	0.33	1.76	1.85	10	0.59	1.49	1.47
	33 (1)	0.35	1.57	1.41	29	0.59	1.69	1.69
	56 (1)	0.35	1.97	2.05	46	0.59	2.56	2.63
	65 (1)	0.37	2.69	2.67	57 (2)	0.59	2.56	2.28
29.1	32	0.39	1.55	1.63	61	0.59	2.60	2.75
42.5	60 (2)	0.40	2.99	2.71	63	0.59	3.14	2.79
35.6	38	0.42	2.20	2.80	13	0.63	1.89	1.69
35.6	36	0.47	1.92	2.12	25	0.63	1.61	1.68
38.5	43	0.47	2.38	2.62	37 (2)	0.63	2.11	2.11
38.5	44	0.47	2.63	2.68	49	0.63	2.79	2.26
38.5	45	0.47	2.50	2.54	14	0.70	1.69	1.75
42.5	66	0.47	2.95	2.53	16	0.70	1.84	1.75
11	9	0.48	1.36	1.42	35	0.71	2.33	1.84
22.4	11	0.48	1.36	1.42	12	0.74	1.80	1.66
38.5	48	0.48	2.20	2.27	39	0.74	2.26	2.00
37.1	51	0.48	2.52	2.60	53	0.74	2.38	2.50
42.5	68 (2)	0.48	3.01	2.95	3	0.75	1.26	1.18
25.3	20	0.49	1.77	1.53	5	0.75	1.12	1.31
25.3	23	0.49	1.75	1.85	64	0.75	3.11	2.79
29.1	26 (2)	0.50	1.88	1.95	1	0.78	0.98	0.98
	19	0.51	1.65	1.57	4	0.79	1.20	1.30
	41	0.51	1.99	2.04	8	0.79	1.22	1.18
	62	0.51	2.97	2.71	47	0.79	2.79	2.61
	67	0.53	2.41	2.52	7	0.80	1.27	1.16
	6	0.55	1.77	1.49	17 (2)	0.80	1.84	1.75
	15	0.55	1.69	1.65	22 (2)	0.82	1.89	1.97
	18	0.55	1.81	1.73	40	0.82	2.43	2.24
	24	0.55	1.76	1.68	2	0.88	1.37	1.39
	28	0.55	1.96	2.14	21 (3)	n/a	n/a	n/a
	30	0.55	1.69	1.73	34 (3)	n/a	n/a	n/a
	52	0.55	2.67	2.34	50 (3)	n/a	n/a	n/a
	54	0.55	2.31	2.23				

NOTES: (1) A supplemental PT was performed. (2) This nozzle was repaired in 2R15. (3) Previously repaired nozzle in 2R14 with greater than 1 inches extent of coverage below pressure boundary weld.